PHY 7550 Course Information Fall 2011

Lecture Time/Room: MWF 10:40-11:35
177 Physics

Lecturer: G. Lawes
391 Physics
577-2774
glawes@wayne.edu

Office Hours: MW 11:40-12:40 or by appointment

Required Text: *Magnetism in Condensed Matter*, Stephen Blundell

Grade Determination:

Midterm	20%
Technical essay	20%
Homework	20%
Participation	10%
Final Exam	30%

Grading Scale: A/A-: 80%-100%; B+/B/B-: 70%-80%; C+/C/C-: 60%-70%; D+/D/D-: 50%-60%; E 0%-50%.

Exams
There will be one in-class exams in addition to the cumulative final exam at the end of the semester. Both exams will be closed book. The final exam is cumulative, with more emphasis placed on materials not covered in the earlier exam.

Homework
Weekly homework assignments are to be turned in at the beginning of class on Friday. You must show your work. Simply giving the final answer will earn no points. Students are encouraged to work together to complete the homework assignments, but each student must turn in his or her own work.

Technical essay
PHY7550 includes a written essay as part of the course requirements. This essay can be on any topic related to the material covered in PHY7550. The essay will be in the form of a review of some current topic in the broad field of magnetism or superconductivity. A list of suggested topics will be provided, but you are welcome to select your own topic and check with me if it is reasonable. The essay will consist of three components: 1) A 300 word abstract due at the beginning of October, 2) A first draft of the essay due at the beginning of November, and 3) The final paper due at the beginning of December. The abstract and first draft will each be worth 5% of the final grade; the final paper will be worth 10% of the final grade. The essays should be approximately five pages (~1200-1500 words) long and be fully referenced.

In-class policies
Out of consideration for the other students in the lecture please abide by the following rules of conduct: (1) Turn off all cell phones while in lecture, (2) Please arrive on time for lecture and do not leave early, (3) Please be mindful of your classmates.

Academic dishonesty
All of the graded assignments are designed to measure your individual understanding of the material. No forms of cheating on these graded assignments will be tolerated (working together on the homework assignments is not considered cheating). Anyone found cheating on any graded activity will receive a grade of zero for that part of their grade, and may receive a failing grade for the course. *Students who plagiarize their essay will receive a failing grade for the course*.

Pre-requisites and co-requisites
This course requires PHY7400 or equivalent background. PHY7050 would also be helpful.

Students with disabilities
If you have any impairment that may interfere with your ability to successfully complete the requirements of this course, or you require additional resources in lectures or during exams, please contact the Education Accessibility Services (EAS) in Room 583 of the Student Center Building to discuss appropriate accommodations on a confidential basis. EAS can also be reached by phone at 313-577-1851.

Date	Lecture Topics (tentative)
8/31	Lattice structure
9/2	Lattice dynamics (phonons)
9/5	HOLIDAY
9/7	Electronic structure
9/9	Electrical and thermal transport
9/12	Review of introductory solid state
9/14	Magnetic moments, classical magnetism
9/16	Quantum magnetism, spin matrices
9/19	Isolated moments in a magnetic field, diamagnetism
9/21	Paramagnetism
9/23	Spin-orbit coupling
9/26	Crystal field, Jahn Teller effect
9/28	Dipolar interactions, exchange interactions
9/30	Superexchange, double exchange
10/3	Dzyaloshinskii-Moriya interactions, spin current
10/5	Ferromagnetic order
10/7	Antiferromagnetic order
10/10	Spiral magnetic order, incommensurate order
10/12	Magnetic domains
10/14	Pauli paramagnetism
10/17	Stoner model, RKKY interaction
10/19	Kondo effect
10/21	Magnetic frustration, quantum magnetism
10/24	Spin glasses
10/26	One dimensional magnets, Haldane effect
10/28	MIDTERM
10/31	Colossal magnetoresistance
11/2	Magnetic nanoparticles, nanoscale magnetism, superparamagnetism
11/4	Magnetoelectrics, magnetodielectrics, and multiferroics
11/7	Review of magnetism
11/9	Superconductivity
11/11	Meissner effect, phenomenology
11/14	Type I and Type II superconductors
11/16	Ginzburg Landau model, flux lattice
11/18	Josephson effect, SQUID
11/21	Andreev reflection
11/23	HOLIDAY
11/25	HOLIDAY
11/28	BCS theory
11/30	Strongly coupled superconductors
12/1	Sr_2RuO_4, MgB_2, B:diamond, K:C_{60}, Pu-based superconductors
12/5	Heavy fermion superconductors
12/7	Cuprate superconductors
12/9	Iron pnictide superconductors
12/12	Review of superconductivity
12/20	**8 :00-10 :30 FINAL EXAM (COMPREHENSIVE)**